

REMARKS

Claims 1, 5, 20, and 24 have been amended. No new matter has been added. Claims 6, 8, 10, 12, 15, 17, and 19 have been canceled. Thus, claims 1-5, 7, 9, 11, 13-14, 16, 18, and 20-33 are pending in the present application.

In the Office Action, claims 1-3, 5-6, 14-15, 20-21, 23-24, and 29 were rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Kragh (U.K. Patent Application GB 2 344 889). Claims 1-3, 5-21, and 23-33 were rejected under 35 U.S.C. 102(e) as being anticipated by DeKok (U.S. Patent No. 6,493,636). Claims 4 and 22 were rejected under 35 U.S.C. 103(a) as being unpatentable over Kragh or DeKok in view of Soubaras (U.S. Patent No. 5,835,451). Claims 6, 8, 10, 12, 15, 17, and 19 have been canceled, rendering the Examiner's rejections of these claims moot. The Examiner's remaining rejections are respectfully traversed.

Independent claims 1, 6, 20, and 24 set forth acquiring seismic data using a seismic source array configured to provide at least two seismic signals having frequency spectra within the seismic bandwidth that contain a source ghost at a non-zero frequency such that the seismic signals combine to form a seismic wavefield having a frequency spectrum within the seismic bandwidth that does not contain a source ghost at a non-zero frequency and processing the acquired seismic data thereby to attenuate the effect of ghost reflections in the seismic data.

Kragh describes techniques for determining a receiver ghost notch frequency and using the receiver ghost notch frequency to estimate the height of the water column about the sensor. However, Kragh does not describe or suggest providing at least two seismic signals having frequency spectra within the seismic bandwidth that contain a source ghost at a non-zero frequency. To the contrary, Kragh also describes towing seismic sensors at a depth where the first non-zero ghost notch frequency is outside the seismic spectrum. See Kragh, page 3. Kragh

also fails to teach or suggest combining the seismic signals to form a seismic wavefield having a frequency spectrum within the seismic bandwidth that does not contain a source ghost at a non-zero frequency.

For at least the aforementioned reasons, Applicants respectfully submit that the present invention is not anticipated by Kragh and request that the Examiner's rejections of claims 1-3, 5, 14, 20-21, 23-24, and 29 under 35 U.S.C. § 102(b) be withdrawn.

DeKok describes using an end-fire technique with a vertically staggered array to produce a seismic signal and processing the acquired seismic data to remove source signal ghosts. However, DeKok fails to teach or suggest providing at least two seismic signals having frequency spectra within the seismic bandwidth that contain a source ghost at a non-zero frequency. DeKok also fails to teach or suggest combining the seismic signals to form a seismic wavefield having a frequency spectrum within the seismic bandwidth that does not contain a source ghost at a non-zero frequency. To the contrary, DeKok teaches that the source signal from the vertically staggered array will include source signal ghosts and therefore the acquired seismic data must be processed after acquisition to remove the source signal ghosts. See DeKok, Col. 7, line 46 – col. 8, line 8 and Figures 2A-2C and 4A-4C.

For at least the aforementioned reasons, Applicants respectfully submit that the present invention is not anticipated by DeKok and request that the Examiner's rejections of claims 1-3, 5, 7, 9, 11, 13-14, 16, 18, 20-21, and 23-29 under 35 U.S.C. § 102(b) be withdrawn.

Moreover, it is respectfully submitted that the pending claims are not obvious in view of the cited references. To establish a *prima facie* case of obviousness, the prior art reference (or references when combined) must teach or suggest all the claim limitations. *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (CCPA 1974). As discussed above, Kragh and DeKok fail to teach

or suggest providing at least two seismic signals having frequency spectra within the seismic bandwidth that contain a source ghost at a non-zero frequency. Kragh and DeKok also fail to teach or suggest combining the seismic signals to form a seismic wavefield having a frequency spectrum within the seismic bandwidth that does not contain a source ghost at a non-zero frequency. The Examiner relies upon Soubaras to describe a technique for separating up soundwaves and down soundwaves in signals received by hydrophones and geophones. However, Soubaras fails to remedy the aforementioned fundamental deficiencies of the primary references.

The cited references also failed to provide any suggestion or motivation to modify the prior art of record to arrive at Applicants claimed invention. To the contrary, the cited references teach away from the Examiner's proposed modification of the prior art. As discussed above, Kragh describes using source notch frequencies 58 to identify receiver notch frequencies 56 and DeKok teaches that the source signal from the vertically staggered array will include source signal ghosts and therefore the acquired seismic data must be processed after acquisition to remove the source signal ghosts. Thus, both Kragh and DeKok teach away from combining the seismic signals to form a seismic wavefield having a frequency spectrum within the seismic bandwidth that does not contain a source ghost at a non-zero frequency. Furthermore, Kragh teaches that the seismic sensors should be towed at a depth where the first non-zero ghost notch frequency is outside the seismic spectrum. Thus, Kragh teaches away from providing at least two seismic signals having frequency spectra within the seismic bandwidth that contain a source ghost at a non-zero frequency. It is by now well established that teaching away by the prior art constitutes *prima facie* evidence that the claimed invention is not obvious. *See, inter alia, In re*

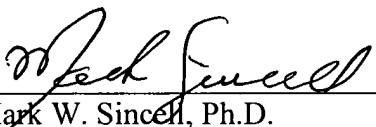
Fine, 5 U.S.P.Q.2d (BNA) 1596, 1599 (Fed. Cir. 1988); *In re Nielson*, 2 U.S.P.Q.2d (BNA) 1525, 1528 (Fed. Cir. 1987); *In re Hedges*, 228 U.S.P.Q. (BNA) 685, 687 (Fed. Cir. 1986).

For at least the aforementioned reasons, Applicants respectfully submit that the Examiner has failed to make a *prima facie* case that the present invention is obvious over the cited references. Applicants request that the Examiner's rejections of claims 4 and 22 under 35 U.S.C. 103(a) be withdrawn.

For the aforementioned reasons, it is respectfully submitted that all claims pending in the present application are in condition for allowance. The Examiner is invited to contact Mark W. Sincell at (713) 934-4052 with any questions, comments or suggestions relating to the referenced patent application.

Respectfully submitted,

Date: 1/25/06



Mark W. Sincell, Ph.D.
Reg. No. 52,226
Williams Morgan & Amerson, P.C.
10333 Richmond Avenue, Suite 1100
Houston, TX 77042
(713) 934-7000
(713) 934-7011 (Fax)

AGENT FOR APPLICANTS